

Mixed Esters of Lactic and Fatty Acids¹

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Earlier papers^{2,3,4,5} described the preparation and properties of acylated derivatives of various lactic esters. This paper reports several additional members of this group of mixed esters of lactic acid.

These esters are the pelargonates of some lactic esters and the laurates of ethyl and butyl lactyl-lactate corresponding to the general formulas $\text{CH}_3(\text{CH}_2)_7\text{COOCH}(\text{CH}_3)\text{COOR}$ and $\text{CH}_3(\text{CH}_2)_{10}\text{COOCH}(\text{CH}_3)\text{COOCH}(\text{CH}_3)\text{COOR}$. The latter may be considered as a derivative of lactyllactic acid.

TABLE I
PROPERTIES OF PELARGONATES AND LAURATES OF LACTIC ESTERS

	Yield, %	B.p., °C.	Mm.	n_D^{20}	d_4^{20}	Viscosity at 20°C., centi- poises	Ester equivalent Found	Ester equivalent Calcd.	Carbon, ^a % Found	Carbon, ^a % Calcd.	Hydrogen, % Found	Hydrogen, % Calcd.
2-Butoxyethyl lactate pelar- gonate	64	160	2.8	1.4379	0.9564	...	165.2	165.2	65.32	65.42	9.98	10.37
2-(2-Butoxyethoxy)-ethyl lactate pelargonate	79	168	1.0	1.4402	0.9740	13.74	186.4	187.2	63.86	64.17	9.89	10.23
2-Chloroethoxyethyl lactate pelargonate	85	178	3.0	1.4496	1.0530	17.98	56.23	57.05	8.39	8.68
Ethyl lactyllactate laurate	83	171	0.9	1.4392	0.9810	25.24	125.3	124.2	64.84	64.48	9.82	9.74
Butyl lactyllactate laurate	..	186-190	1.2	1.4415	0.9677	22.38	132.6	133.5	65.47	65.97	10.02	10.07

^a The author is indebted to C. L. Ogg and Mary J. Welsh for analytical data. ^b % Cl 10.62 (found); 10.53 (calcd.).

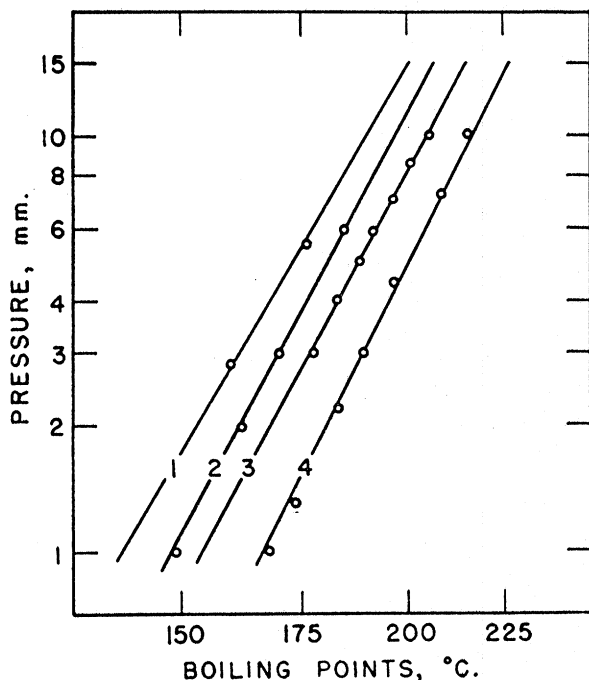


Fig. 1.—Boiling points of lactate pelargonates: 1. 2-butoxyethyl lactate pelargonate; 2. *n*-butyl phthalate; 3. 2-chloroethoxyethyl lactate pelargonate; 4. 2-(2-butoxyethoxy)-ethyl lactate pelargonate.

- (1) Not copyrighted.
- (2) M. L. Fein and C. H. Fisher, *THIS JOURNAL*, **68**, 2631 (1946).
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Experimental

Materials.—2-Butoxyethyl, 2-(2-butoxyethoxy)-ethyl and 2-chloroethoxyethyl lactates were prepared as described previously.^{2,6} Ethyl lactyllactate was obtained by distillation of ethyl polylactate prepared by the self-alcoholysis of ethyl lactate.⁷

Preparation of Esters.—The lactate pelargonates were prepared by acylating the appropriate lactate with redistilled pelargonyl chloride; ethyl lactyllactate laurate by acylation of ethyl lactyllactate with redistilled lauroyl chloride. The conventional acid chloride acylation method was employed.^{3,4} Butyl lactyllactate laurate was obtained as a by-product in the esterification of butyl lactate with lauric acid in a modification of the method described in an earlier paper.⁸

The esters prepared and their properties are listed in Table I. These esters exhibited slight solubility (less than 0.03 g. per liter) in water at room temperature, and were found to be compatible with ethyl cellulose though incompatible with cellulose acetate.

Vapor pressures of the lactate pelargonates were determined by distillation in a tensimeter still.⁹ The boiling points in the range of 1 to 10 mm. are shown in Fig. 1. The line for *n*-butyl phthalate is included for purposes of comparison.

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- (10) One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, United States Department of Agriculture.